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## Repair = care: system stories from Norway and Ghana

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A close-up photograph of a person's hands working on a disassembled smartphone. The person is using a small screwdriver to work on the internal components of the phone. The background is a cluttered workbench with various electronic components, including other disassembled phones, a soldering iron, and a spool of solder. The lighting is bright, highlighting the intricate details of the repair work.

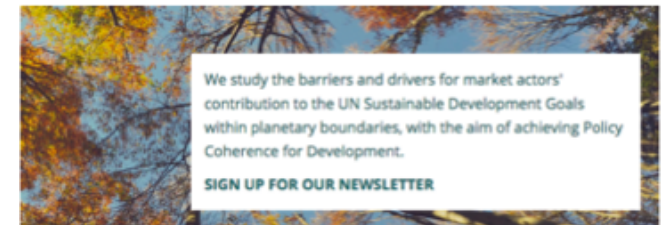
# REPAIR = CARE

## Systems stories from Norway and Ghana

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# Overview

- Circular economy
  - Re-use, Refurbish, Repair, Recycle
- Systems stories of informal repair in Norway and Ghana
  - Community repair in Oslo, Norway
  - Informal repair in Accra, Ghana
  - *Repairing broken smartphone screens*
- Repair = Care
  - A systemic design intervention
  - Mending broken worlds?
  - A doings of care



Sustainability: **Securing the social foundation for people everywhere now and in the future, while staying within planetary boundaries**

Mobile phone life cycle: **Life threatening** impacts, especially in the resource extraction, manufacturing, and end-of-life phases (hotspots)

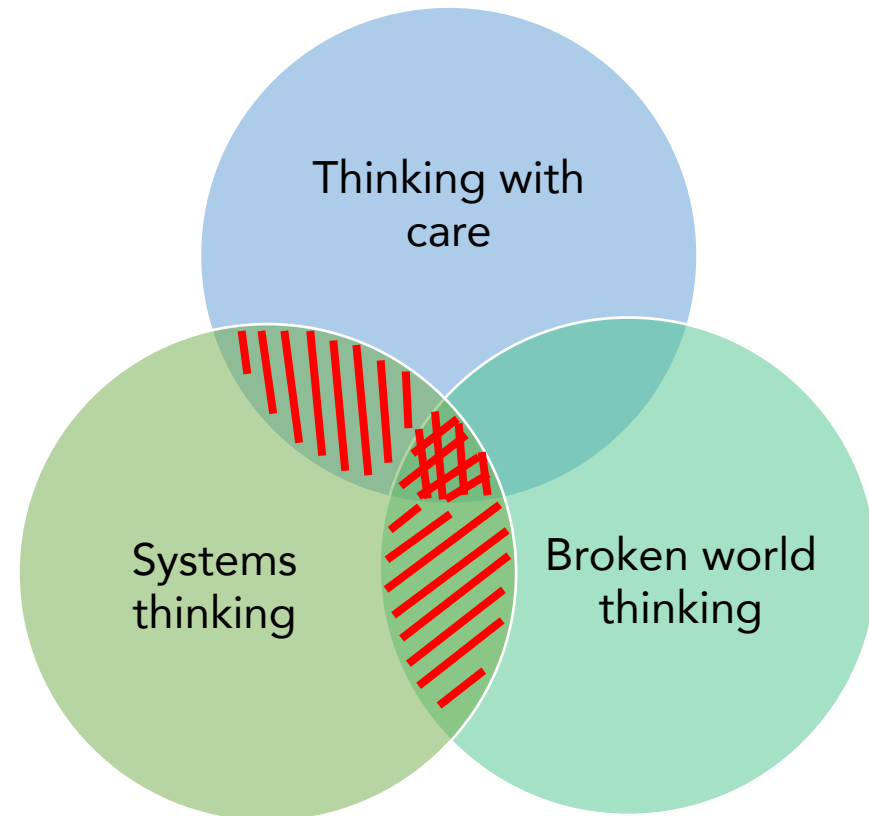
# Epistemological and methodological positioning

Main influences:

**Ray Ison** (2017): *Systems Practice: How to Act - In Situations of Uncertainty and Complexity in a Climate-Change World* (2nd ed.)

**Steve Jackson** (2014): *Rethinking Repair* (Broken world thinking)

**Maria Puig de la Bellacasa** (2011): *Matters of care in technoscience: Assembling neglected things*



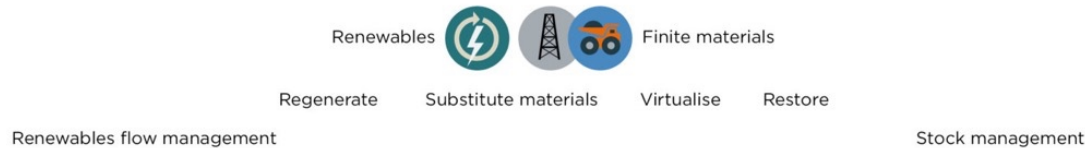


## OUTLINE OF A CIRCULAR ECONOMY

### PRINCIPLE

1

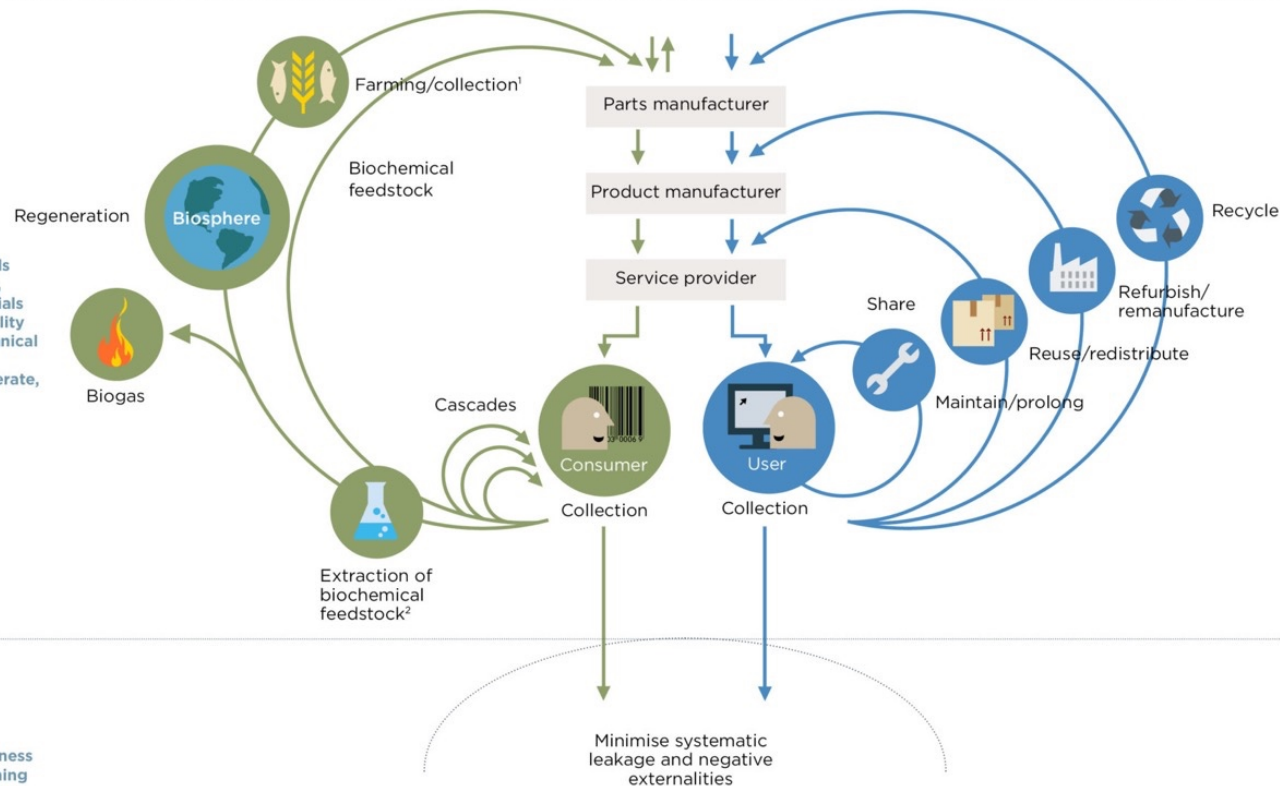
Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows  
ReSOLVE levers: regenerate, virtualise, exchange



### PRINCIPLE

2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles  
ReSOLVE levers: regenerate, share, optimise, loop



### PRINCIPLE

3

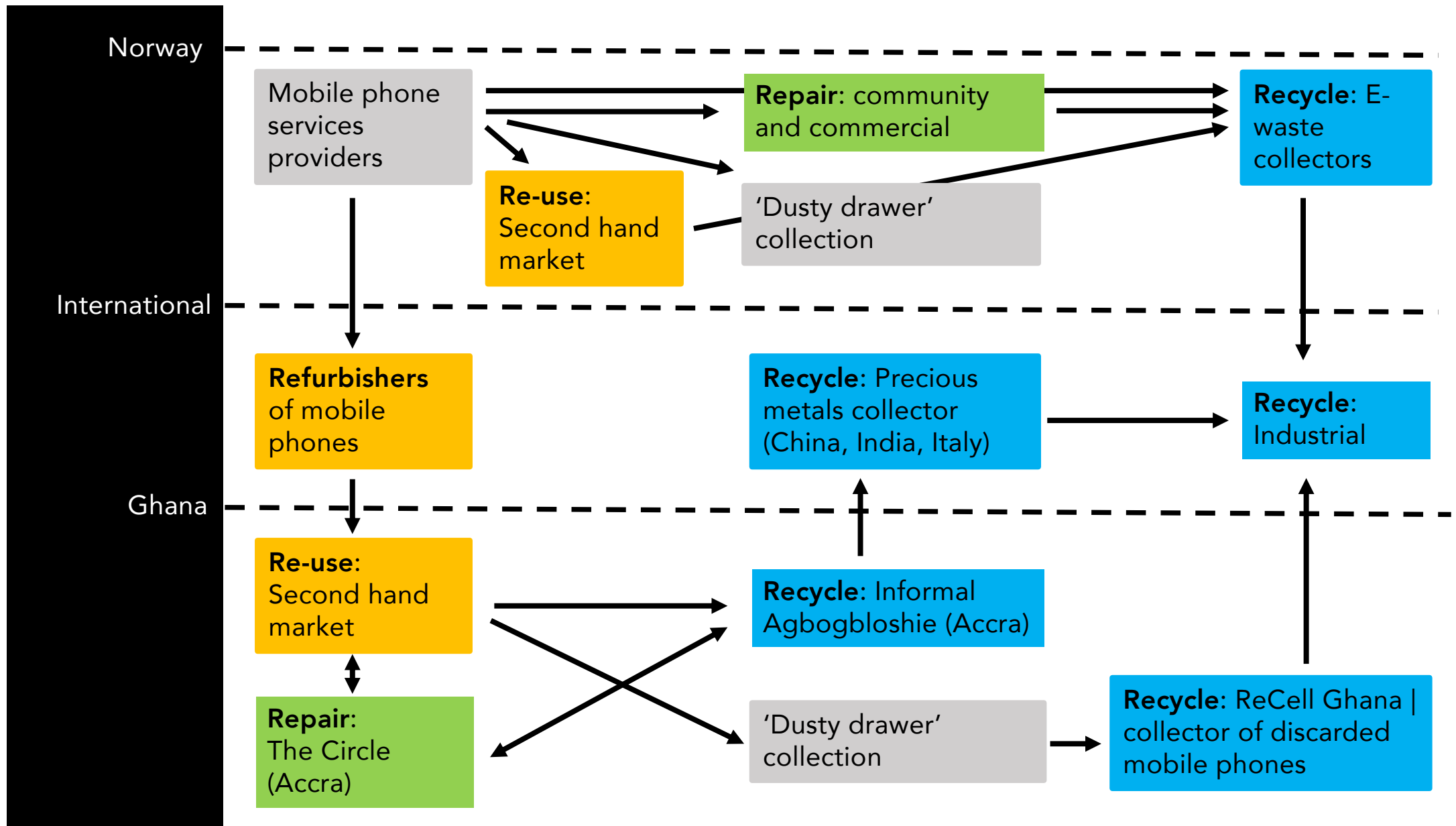
Foster system effectiveness by revealing and designing out negative externalities  
All ReSOLVE levers

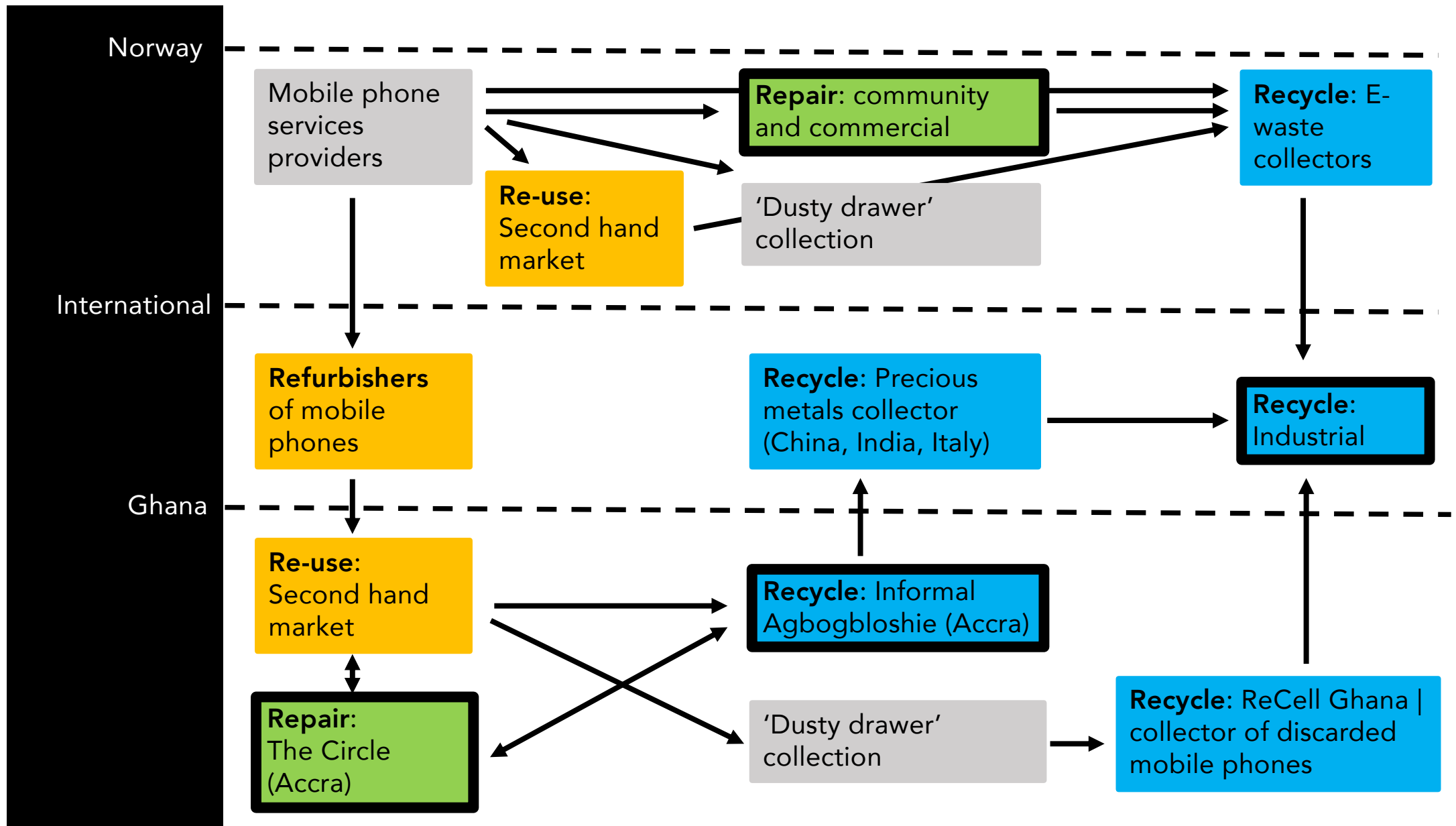
Minimise systematic leakage and negative externalities

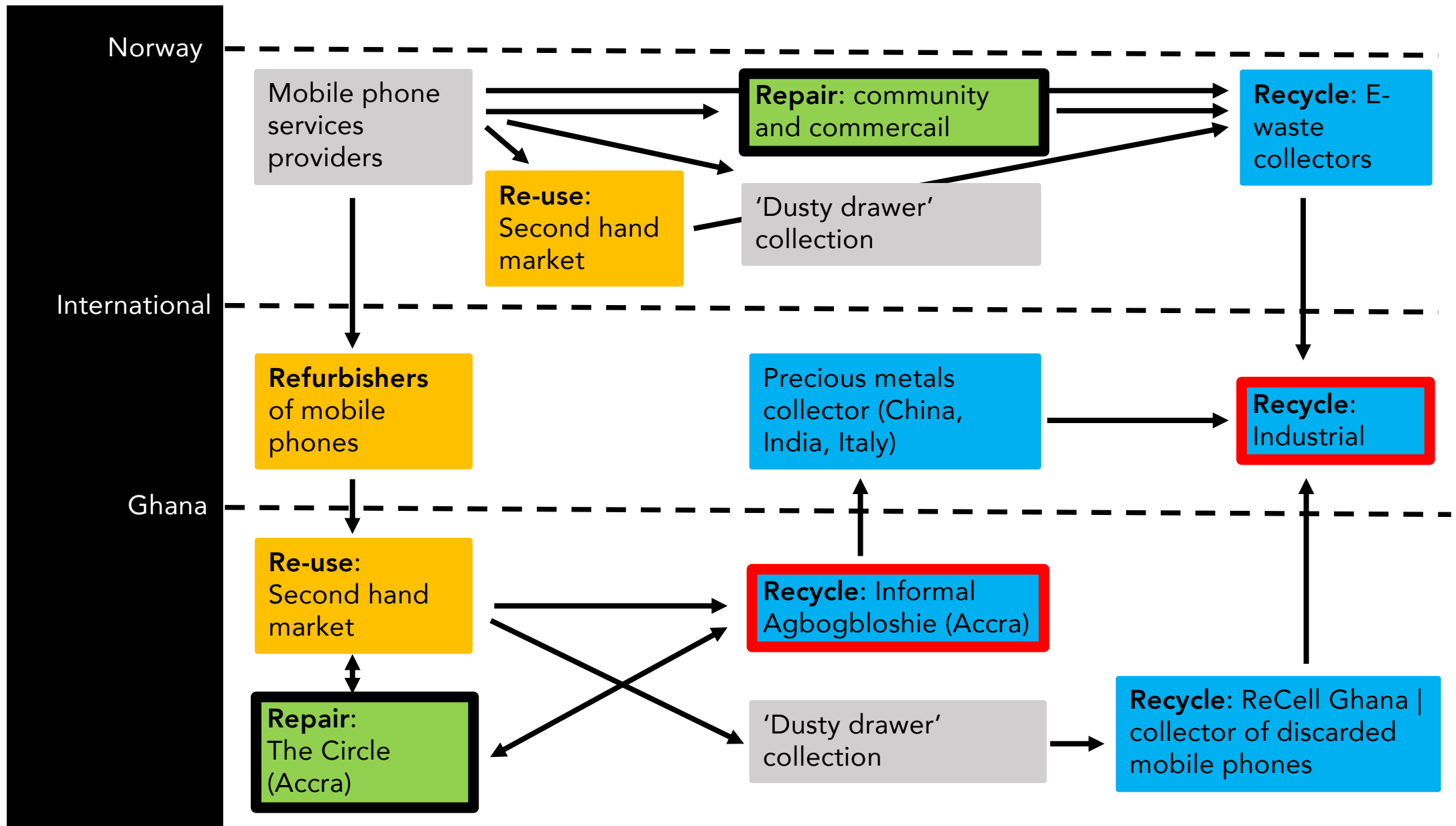
1. Hunting and fishing  
2. Can take both post-harvest and post-consumer waste as an input  
Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment; Drawing from Braungart & McDonough, Cradle to Cradle (C2C).

## Mobile phone life cycle in a circular economy perspective:

- Prolong the lifespan through maintenance and **repair**
- Prolong the lifespan through **re-use** (second-hand market)
- Prolong the lifespan of materials through **refurbishment** and remanufacturing
- **Recycle**











Recycling in Agbogbloshie





use of simple and cheap tools | cherry-picking the most valuable components



Whole phone



TSL Furnace

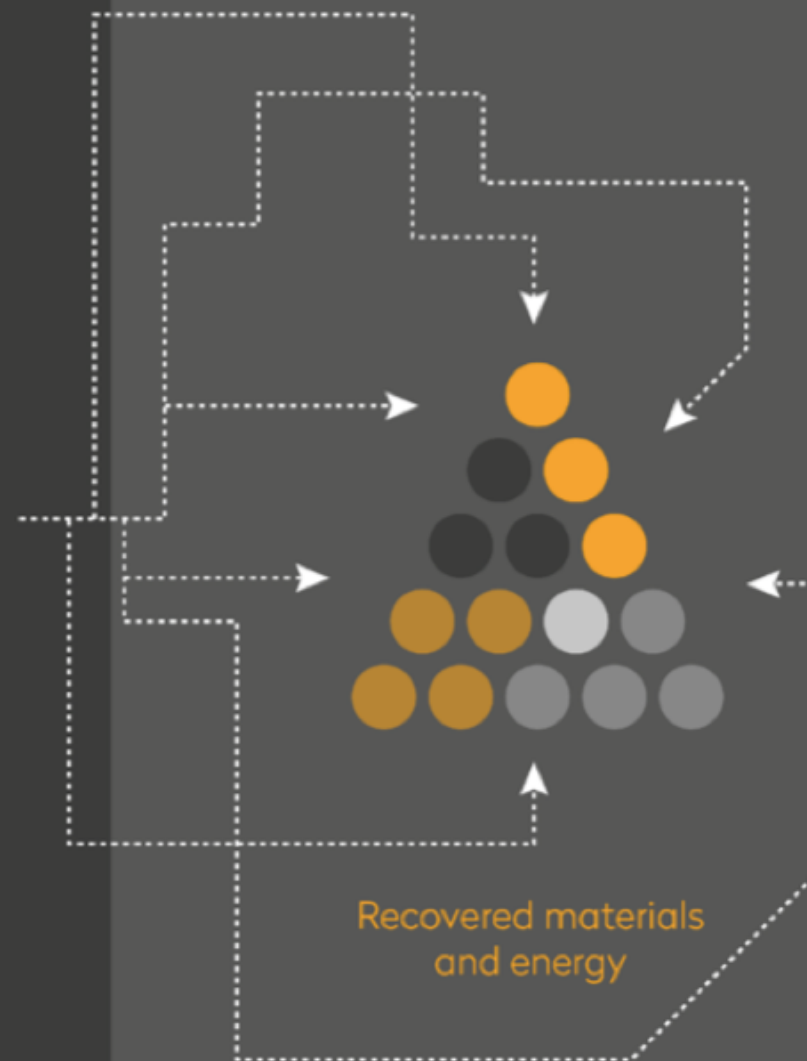


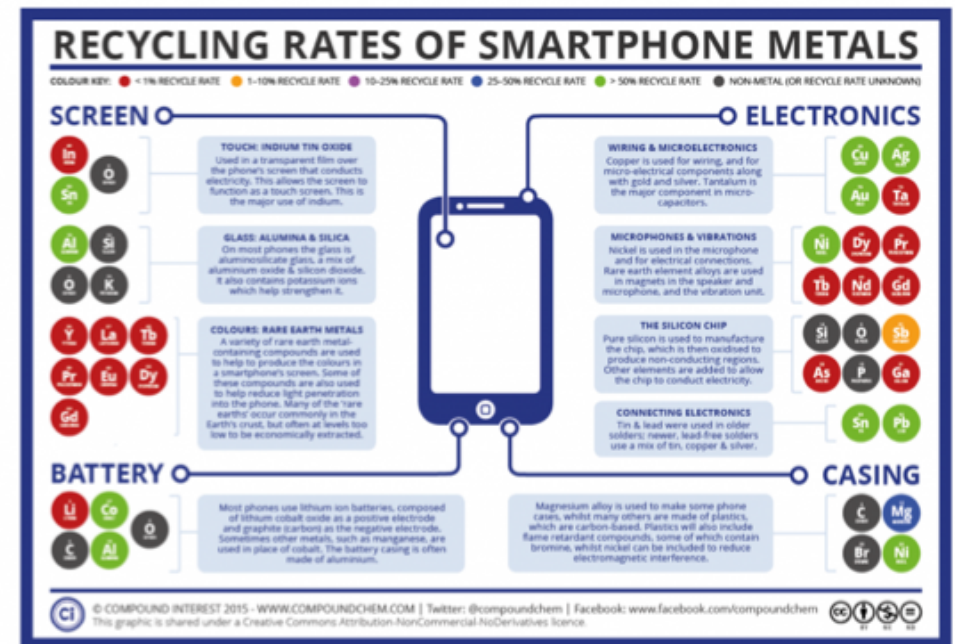
Photo credit: Fairphone

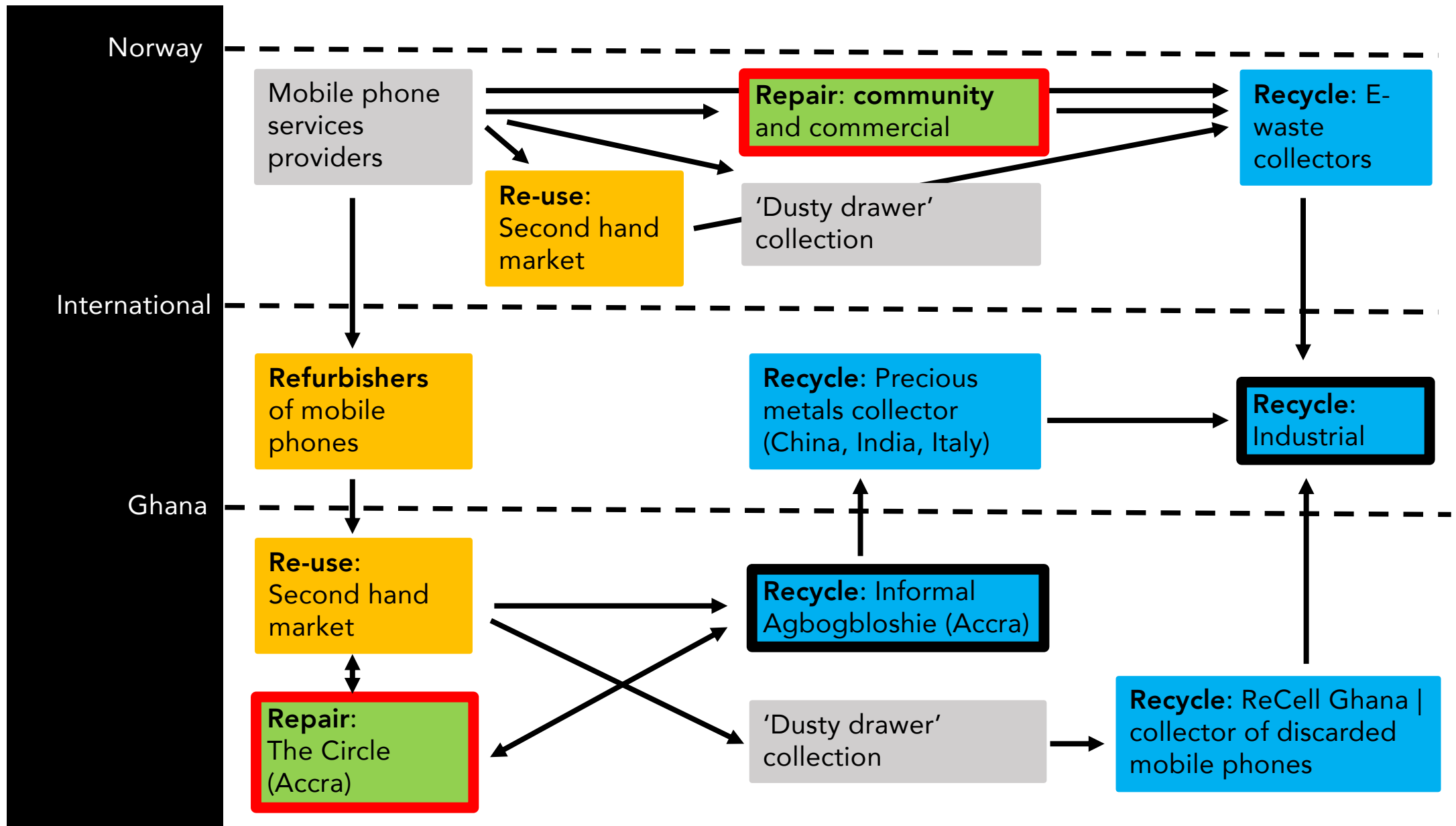
Recycling at Umicore | 17 metals recovered | plastic and other materials are used as fuel | slag used in building materials



# Mobile phone recycling challenges

- Location
  - Many mobile phones end up in countries without e-waste management system (via second-hand market)
- Not designed for disassembling
  - Increasing use of glue
  - Special tools needed
- Informal recycling
  - Cherry picking - only valuable parts are recycled
  - Loss of energy and materials
- Industrial recycling
  - Loss of energy and materials







# Repair stories as systems stories

- “Telling stories is a powerful way to make sense of our own experience and of the world around us. Stories shape our identity, communicate who we are and what is important to us, and move others to act” (Peter Stroh, 2015)
- “It matters what stories tell stories ” (Donna Haraway, 2017)
- Stories from the “ruins of capitalism” (Anna Tsing, 2017)







#	navn	hva (år)
16.	Silvia	elbillader nissan (6)
17.	Vetle	del av høyttaler (10)
18.	Remi	grafikk kort (25+) pc
19.	Henning	knust bakdeksel mobil HTC (10)
20.	Oda	Lader til laptop acer (3)
21.	Oliver	Yamaha keyboard (40)
22.	Petter	Samsung og mobil (18 months)
23.	Audun	Philips LP spiller (35)
24.	Thomas	iPhone 6 (5)
25.	Terje	Lydkart Zoom (2)
26.	Håvard	Bluetooth høyttaler
27.	Maria	Sandstrøm radio (5)
28.	Håvard	CD-spiller Pioneer (4)

Community repair in Norway





Mobile phone repair at the Circle in Accra, Ghana

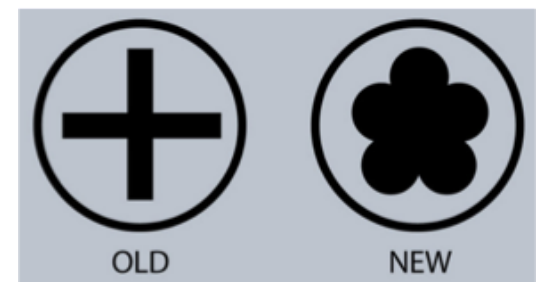




highly-skilled repairers | parts from broken phones often used as spare parts

# Mobile phone repair challenges

- Costs
  - Often too expensive
  - Expensive spare parts
- Not designed for repair
  - Increasing use of glue
  - Special tools needed
- Problematic access to spare parts & manuals
  - Court cases against mobile phone repairers
- Right to repair under attack
  - Warranty lost when using unauthorised repairer or DIY repair





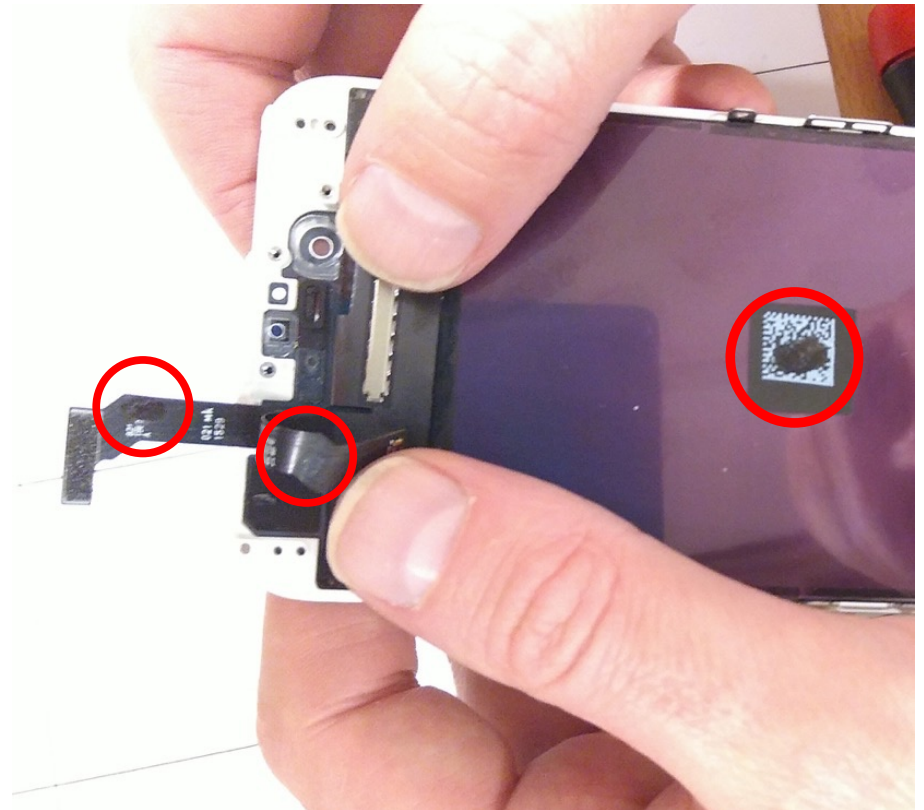
# Repair = Care: Community repair



iPhone 6s: € 380

## Broken screen repair:

- Apple: € 240
- Community repair: € 95 for original screen (logos blacked out) or € 45 for a copy
- Whole display unit replaced



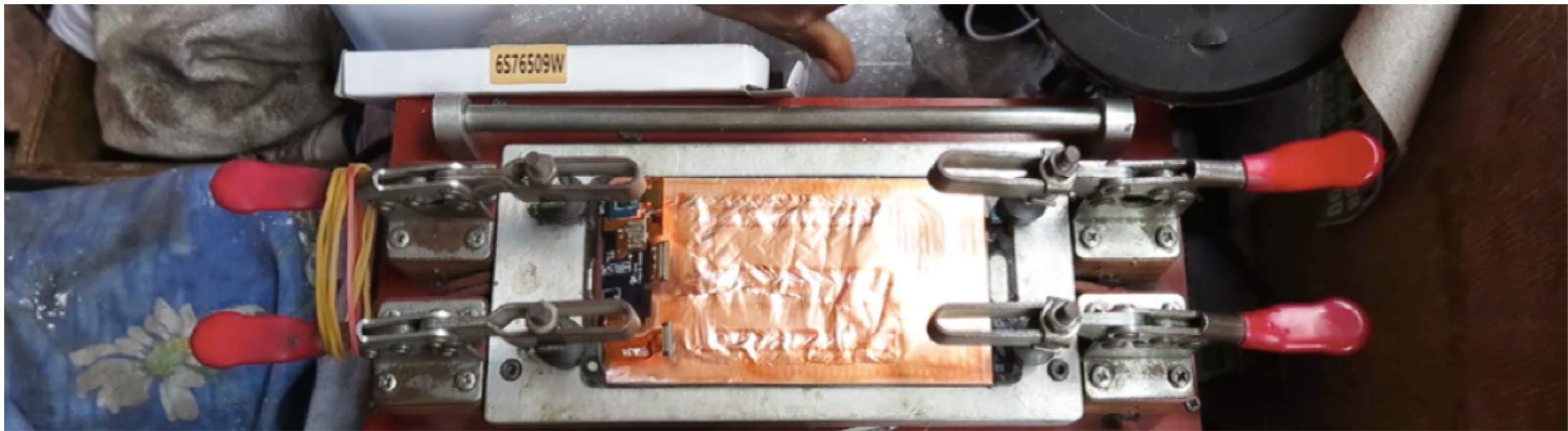
# Repair = Care: The Circle



- Only broken part replaced

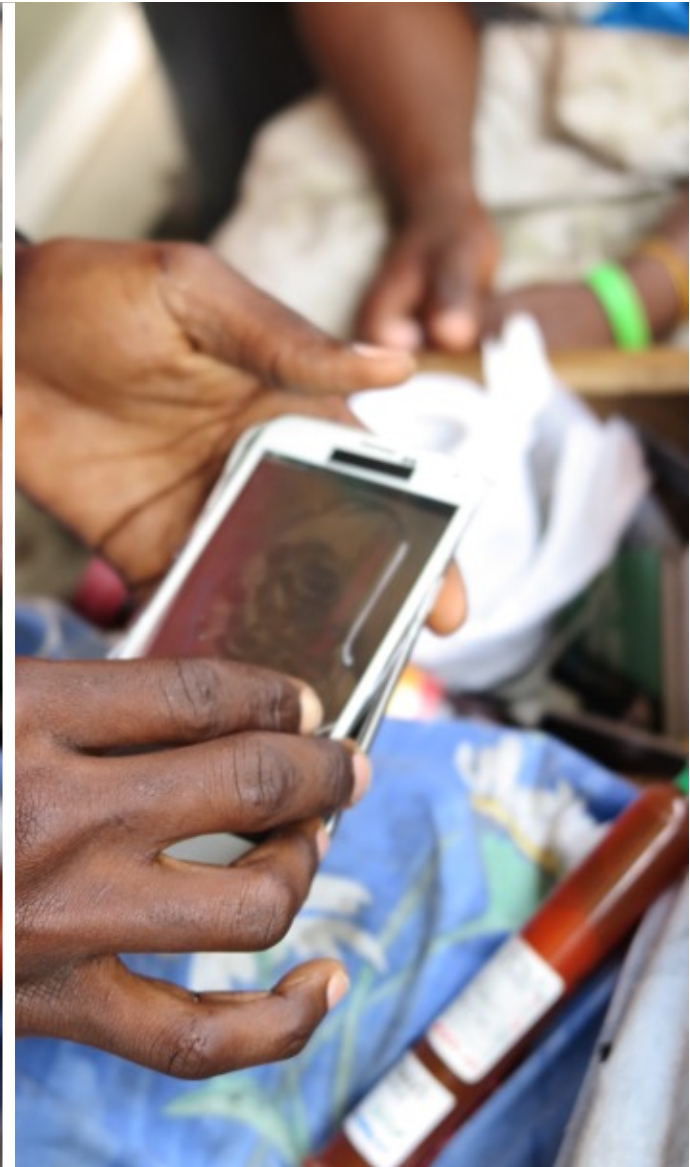






separating the broken glass from the display unit





Adding the right amount of glue to fasten the new glass






testing if the display unit works | hardening the glue

# Repair = Care: Fairphone



◀ Spare Parts



The product page for the Fairphone 2 Display Module. It features a large image of the display module, a smaller image of the phone with the module installed, and a smaller image of the module being replaced. Navigation arrows are on the left and right of the main image. A magnifying glass icon is on the right side of the product images.

## Fairphone 2 Display Module

Replace your screen in record time

Our sturdy display module is fitted with a 5-inch Full HD display for a bright and clear picture, and Gorilla® Glass 3 for greater damage resistance in case your phone takes a tumble.

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**Supply chain stories**

Do you want to know more about what happened with our phone screens? Our Chief Technical Officer Olivier shares a behind the scenes look [on the blog](#).

**€87.00**

[Add to Cart](#)

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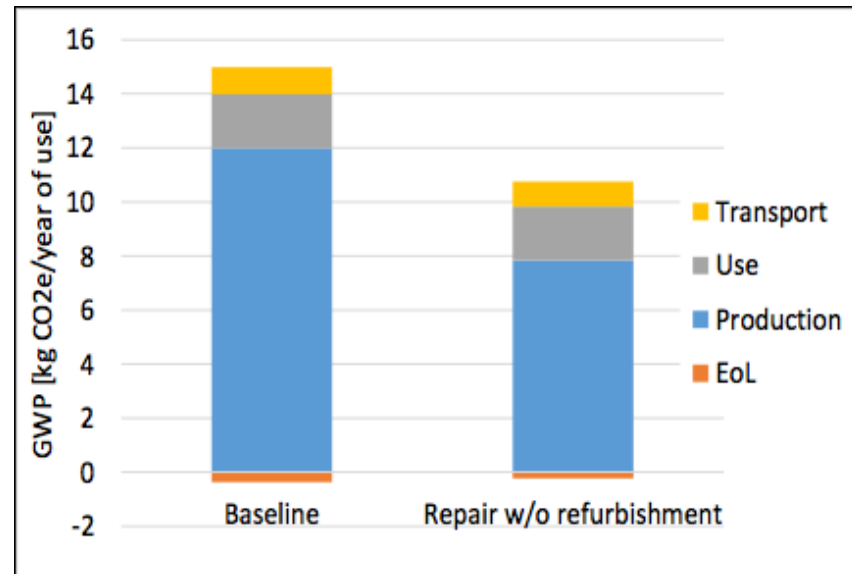
Software requirements

## Repair = Care: Fairphone

- Extending the life span of mobile phones to 5 years
- Slowing down the circular economy
- Diminishing the environmental and social risks in the mobile phone life cycle
- Lower global warming potential (GWP)

### Results per year of use - baseline and repair scenario

- Increasing the use-time by two years (5 instead of 3) decreases the yearly GHG emissions by ~ 30 %



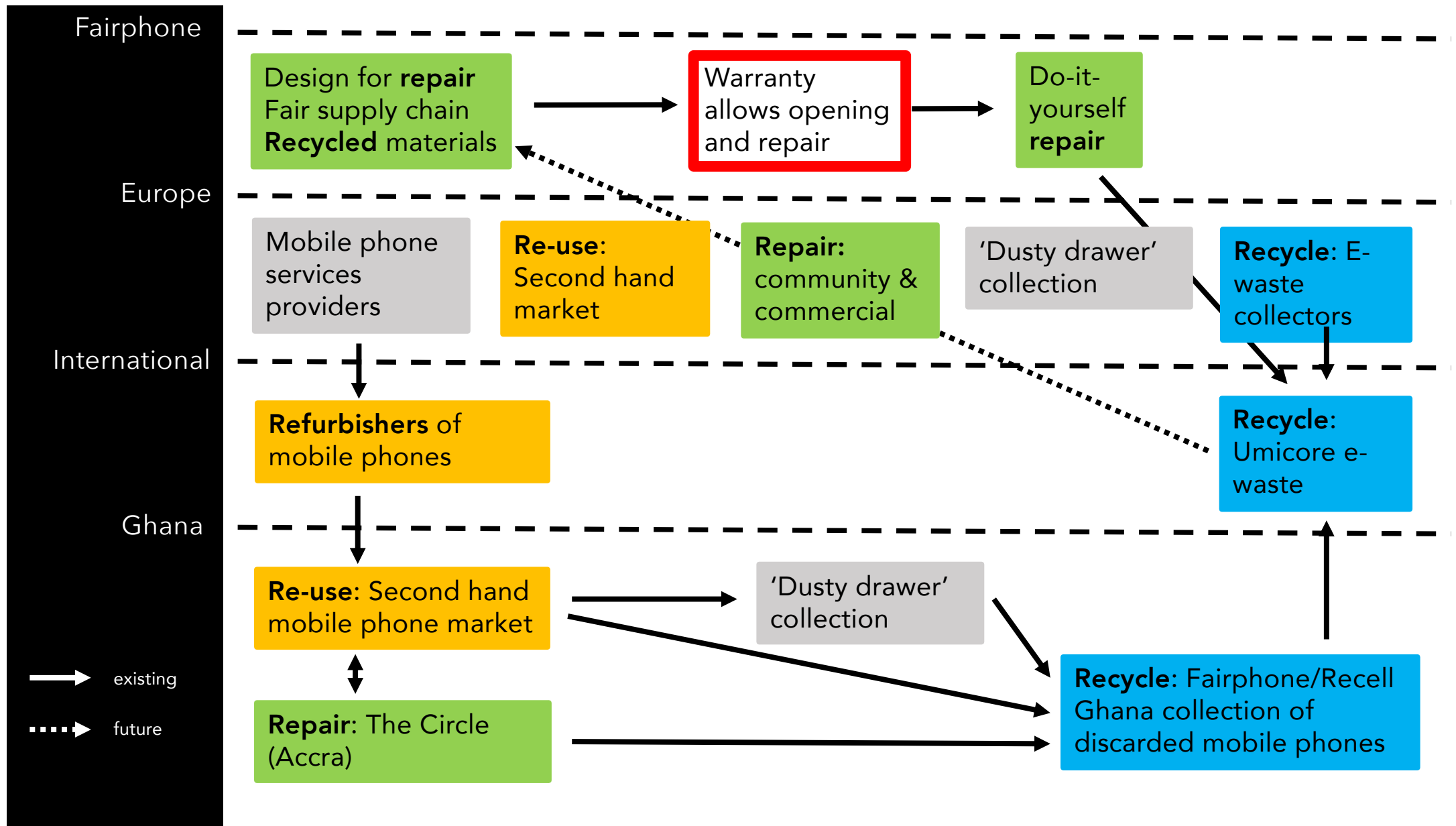
06.02.2017

Department Environmental and Reliability Engineering

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Proske





# Repair = Care

- **Systemic design intervention** through the use of deep leverage points (Abson et al., 2016; based on Meadows, 1999)
  - Design of the system
    - The structure of information flows
    - The rules of the system
  - Intent of the system:
    - The goal of the system
    - The mindset/paradigm out of which the system arises
- Mending **broken worlds**?
  - (More) work for repairers, but what about the scavengers and recyclers at Agbogbloshie? Train them to become disassemblers for the collectors (Bo2W approach) and/or repairers?
- Doings of **care**
  - «... more than the responsible maintenance of technology» (de la Bellacasa, 2011)
  - Paying attention/giving voice to marginalised issues, such as informal work
  - Care can be transitional and potentially transformative





Photo caption:

Fairphone  
designer  
Miquel  
Ballester  
discusses the  
repairability of  
Fairphone  
modules with  
repairers in  
Ghana

Thank  
you